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TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No. 46309/268337

In Re Application Of: **Peter Kenington**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/030,206	12/31/01	Juan Torres	22186	2631	9002

Invention: **REDUCING DISTORTION OF SIGNALS**

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **10/06/05**

The fee for filing this Appeal Brief is: **$500.00**

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Steve Mendelsohn

Signature

Dated: 12/5/05

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OIPE DEC 07 2005 PATENT & TRADEMARK OFFICE

CUSTOMER NO. 22186 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1052.036

In re application of: Peter Kenington

Serial No.:	10/030,206	Group Art Unit:	2631
Filed:	12/31/01	Examiner:	Juan Torres
Andrew No.:	784	Phone No.:	571-272-3119

For: Reducing Distortion of Signals

APPELLANT'S BRIEF (37 CFR 1.192)

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22213-1450

ATTENTION: Board of Patent Appeals and Interferences

In response to the final office action of 07/08/05 and the advisory action of 09/23/05, and further to the notice of appeal filed on 10/06/05, Appellant/Applicant submits this brief in triplicate in support of the appeal.

I. REAL PARTY IN INTEREST (37 CFR 1.192(c)(1))

Other than the named inventor listed in the caption of this brief, the real party in interest is the assignee Andrew Corporation of Orland Park, Illinois.

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Certification Under 37 CFR 1.8

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Gerry Marrero
(Signature of person mailing)

II. RELATED APPEALS AND INTERFERENCES (37 CFR 1.192(c)(2))

The Appellant, the Appellant's below-named attorney, and the Assignee are not aware of any other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS (37 CFR 1.192(c)(3))

The status of the pending claims in this application is as follows:

Pending Claims	Status
1-50	Canceled
51	Pending and rejected
52-53	Canceled
54	Pending, rejected, and appealed
55-56	Canceled
57	Pending, rejected, and appealed
58-61	Canceled
62	Pending and rejected
63-64	Canceled
65	Pending, rejected, and appealed
66-67	Canceled
68	Pending, rejected, and appealed
69-72	Canceled
73	Pending and rejected
74-81	Pending, rejected, and appealed
82	Pending and rejected
83-90	Pending, rejected, and appealed

IV. STATUS OF AMENDMENTS (37 CFR 1.192(c)(4))

An Amendment under 37 CFR 1.116 was filed on 09/07/05. This "after-final" amendment proposed to amend the claims as follows:

- o Amend claim 51 to incorporate the features of claim 54;
- o Cancel claim 54;
- o Amend claim 62 to incorporate the features of claim 65;
- o Cancel claim 65;

- o Amend claim 73 to incorporate the features of claim 77;
- o Cancel claim 77;
- o Amend claim 78 to depend from claim 73;
- o Amend claim 82 to incorporate the features of claim 86;
- o Cancel claim 86; and
- o Amend claim 87 to depend from claim 82.

In the advisory action of 09/23/05, the Examiner indicated that the proposed claim amendments in the after-final amendment "are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal." As such, the Examiner indicated that the after-final amendment would not be entered for purposes of appeal.

The Appellant respectfully disagrees with the Examiner and submits that the Examiner's refusal to enter the after-final amendment was improper. In particular, the Appellant submits that the proposed amendments would materially reduce and simplify the issues for appeal. As such, for purposes of this appeal, the Appellant requests entry of the after-final amendment filed on 09/07/05.

V. SUMMARY OF INVENTION (37 CFR 1.192(c)(5))

The invention is related to techniques for reducing distortion of an output signal generated by signal handling equipment, such as (but not necessarily limited to) an amplifier. According to certain embodiments of the invention, a raw signal is processed based on data selected from a group of look-up tables (LUTs), where each LUT corresponds to a component of the raw signal having a different frequency or band of frequencies, and each LUT stores data corresponding to the amplitude of that component.

Digital signal processor (DSP) 10 of Fig. 1 shows an exemplary lineariser of the present invention in which predistorter 26 modifies the raw I-channel digital input signal and predistorter 28 modifies the raw Q-channel digital input signal in order to reduce distortion in the RF output signal generated by RF power amplifier 22. See, e.g., page 4, line 9, to page 6, line 11, of corresponding PCT application PCT/GB00/02464.

Fig. 2 shows one exemplary implementation of predistorter 26, where band-pass filters 46-52 divide the raw I-channel input into different components, each associated with a different frequency band, where each different frequency band has its own corresponding LUT 54-60. Data is retrieved from each LUT based on the amplitude of the corresponding frequency-band component and then combined at combiner 80 to generate a predistorted I-channel signal. See, e.g., page 6, line 12, to page 8, line 15, of the corresponding PCT application.

Fig. 4 shows an alternative implementation of predistorter 26, where fast Fourier transformation (FFT) process 82 divides the raw I-channel input into different components, each associated with a different frequency, where each different frequency has its own corresponding LUT 86. Data is retrieved from each LUT based on the amplitude of the corresponding frequency component and then combined at inverse FFT process 88 to generate a predistorted I-channel signal. See, e.g., page 8, line 16, to page 9, line 27, of the corresponding PCT application.

VI. ISSUES (37 CFR 1.192(c)(6))

A first issue is whether claims 54 and 65 are anticipated by U.S. Patent No. 5,867,065 (hereinafter Leyendecker) under 37 U.S.C. 102(e).

A second issue is whether the combination of claim 57 with claim 54 and the combination of claim 68 with claim 65 are anticipated by Leyendecker under 37 U.S.C. 102(e).

A third issue is whether claims 77 and 86 are anticipated by U.S. Patent No. 6,798,843 (hereinafter Wright) under 37 U.S.C. 102(e).

A fourth issue is whether the different combinations of claims 74-76 and 78-81 with claim 77 and the different combinations of claims 83-85 and 87-90 with claim 86 are anticipated by Wright under 37 U.S.C. 102(e).

Leyendecker and Wright are referred to herein collectively as "the cited references."

VII. GROUPING OF CLAIMS (37 CFR 1.192(c)(7))

The claims do not all stand or fall together, but rather may be grouped as follows:

Group	Claims
A	54, 65
B	54+57, 65+68
C	77, 77+74, 77+78, 77+79, 86, 86+83, 86+87, 86+88
D	77+75, 86+84
E	77+76, 86+85
F	77+80, 86+89
G	77+81, 86+90

Note that the notation "54+57" corresponds to the combination of claims 54 and 57. Since the after-final amendment proposed to amend claim 51 to include the features of claim 54 and since claim 57 depends from claim 51, if the after-final amendment is entered (as the Appellant believes it should be), then claim

57 would effectively depend from previously pending claim 54. As such, claim 54+57 corresponds to claim 57 assuming that claim 51 is amended to include the features of claim 54. The Appellant apologizes for the awkwardness of this notation, which is a direct result of the Examiner's improper refusal to enter the after-final amendment.

VIII. ARGUMENTS - REJECTIONS UNDER 35 U.S.C. § 102(e) (37 CFR 1.192(c)(8)(iii))

<u>Group A:</u>

As to Group A, claim 54 is directed to a lineariser for reducing distortion of an output signal of signal handling equipment, by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal. The store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

As explicitly described in the specification of the present application, a raw signal can be divided into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies. For example, in the embodiment shown in Fig. 2, different copies of a raw I-channel input signal are applied to different band-pass filters, each corresponding to a different band of frequencies. As such, the output of each different band-pass filter is a "raw component" signal corresponding to a different band of frequencies. The amplitudes of these different raw component signals are used as indices into a set of LUTs, where each different LUT corresponds to a different band of frequencies, as represented in Fig. 3.

As another example, in the embodiment shown in Fig. 4, the raw I-channel input signal is applied to an FFT process that converts the time-domain input signal into the frequency domain, where the signal is represented by a plurality of components, each corresponding to a different frequency, where the amplitude of each component is used as the index into a different LUT corresponding to the frequency of that component.

In rejecting claim 54, the Examiner cited Figs. 8 and 12 and column 14, lines 16-34, of Leyendecker. On page 4 of the final office action, the Examiner stated that "The frequency content of the signal is clearly described in the cited section when [Leyendecker] mentions a predistortion filter, that will be frequency dependent." The Appellant submits that the issue is <u>not</u> whether the <u>signal</u> has "frequency content"; the issue is whether <u>each</u> of a plurality of <u>LUTs</u> corresponds to a <u>different</u> frequency or band of frequencies.

The Examiner stated further on pages 4-5 of the final office action that "the frequency dependence is expressed as he very well known term 'bin'; also in tables 1-3 it is expressed this

dependence and how the LUT table is contracted in function of the bins," citing column 14, line 10, to column 18, line 57. On page 6, the Examiner stated: "Each bin is a sample in the frequency domain." The Appellant submits that the Examiner has misinterpreted the teachings in Leyendecker.

The teachings in the passage cited by the Examiner (i.e., column 14, line 10, to column 18, line 57) relate to a process for updating the values stored in Leyendecker's LUT. In particular, according to that LUT update process, after interpolating data samples, "trainer **431** then quantizes the samples into 'bins' that are equal in number to the number of table addresses in the predistorter LUT." See column 14, lines 16-18. As known in the art, a bin refers to a specified range of values. In Leyendecker, each bin corresponds to a specific range of <u>amplitude values</u> for the data samples, where a bin value represents the number of data samples that had amplitude values that fell within the range of amplitude values corresponding to that bin. As such, each of Leyendecker's bins corresponds to samples in the <u>amplitude</u> domain, <u>not</u> the <u>frequency</u> domain. The bin values are then used to update the LUT data.

None of this has anything to do with multiple LUTs corresponding to different <u>frequencies</u> or different <u>bands of frequencies</u>. Leyendecker does not teach or even suggest a plurality of LUTs, where each table corresponds to a component of the raw signal having a different frequency or band of frequencies. Significantly, the bins taught in Leyendecker correspond to different ranges of signal <u>amplitudes</u>, <u>not</u> to different signal <u>frequencies</u>.

For all these reasons, the Appellant submits that claim 54 is allowable over Leyendecker. For similar reasons, the Appellant submits that claim 65 is allowable over Leyendecker.

<u>Group B:</u>

As to Group B, according to claims 57 and 68, the raw signal is divided into a number of components having different frequencies or bands of frequencies. In rejecting claim 57, the Examiner cited Fig. 12, block 1201, and column 14, lines 16-34, of Leyendecker. As described in column 14, lines 16-34, solver 1201 quantizes the samples into bins based on the different <u>amplitudes</u> of the samples. Solver 1201 does <u>not</u> divide a raw signal into components having different <u>frequencies</u> or bands of frequencies.

On page 7 of the advisory action, the Examiner stated that "The interpolation/extrapolation is in frequencies 'bins'. When a frequency that is not in the table is needed, the an interpolation/extrapolation is performed. The sample are frequency samples, 'bins'." The Appellant submits that Leyendecker provides no such teachings.

Assuming entry of the after-final amendment, the Appellant submits that this provides additional reasons for the allowability of the combination of claims 54 and 57 and the combination of claims 65 and 68 over Leyendecker.

Group C:

As to Group C, claim 77 is directed to a method for reducing distortion in an output signal generated by signal handling equipment. In particular, a raw signal is divided into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies. A modified component is generated for each raw component based on the amplitude of the raw component <u>by retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT</u>. The plurality of modified components are combined to generate a modified signal. The Appellant submits that Wright does not teach or even suggest such a combination of features.

In the final office action, the Examiner cited Figs. 15-17 and column 28, line 48, to column 29, line 17, of Wright in rejecting claims 77 and 86. Figs. 15-17 show power amplifier models of progressively increasing orders of complexity. Each model has an FIR filter 76 and a LUT 78 that stores different sets of coefficients for the FIR filter. In particular, Fig. 15 shows a one-dimensional LUT whose FIR coefficients are accessed using an address derived from the magnitude of the input signal Vm(t). Fig. 16 shows a two-dimensional LUT whose FIR coefficients are accessed using a first address derived from the magnitude of the input signal Vm(t) and a second address derived by differentiating the input signal Vm(t). Lastly, Fig. 17 shows a three-dimensional LUT whose FIR coefficients are accessed using a first address derived from the magnitude of the input signal Vm(t), a second address derived by differentiating the input signal Vm(t), and a third address derived by integrating the input signal Vm(t). According to Wright, the model of Fig. 17 "permits the amplifier's nonlinearity to be characterized as a function of frequency, input signal level, rate of change of envelope and integrated past power profile." See column 29, line 9-13.

Significantly, Wright does not teach dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies and where a modified component is generated for each raw component based on the amplitude of the raw component by retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT.

In rejecting claims 73 and 82, the Examiner cited Wright's Figs. 3 and 8 as showing examples of dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies.

Wright's Fig. 3 shows one embodiment of digital compensation signal processor (DCSP) 52 having a predistortion FIR filter 52A that filters an input signal Vm(t) based on filter coefficients

retrieved from two-dimensional LUT 52H. Wright's Fig. 8 shows an expansion of DCSP 52 having four predistortion FIR filters 52A, each of which filters a different-order multiple of input signal Vm(t) based on filter coefficients retrieved from three-dimensional LUT 52H.

If Wright's Figs. 3 and 8 teach "dividing a raw signal into a plurality of raw components, where each raw component corresponds to a different frequency or band of frequencies," then Wright's "raw components" must be the outputs of the four FIR filters in Fig. 8.

But if those are examples of the raw components of claims 77 and 86, then Wright fails to teach "generating a modified component for each raw component based on the amplitude of the raw component by retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT." The only LUT taught by Wright is LUT 52H of Fig. 8, which is analogous to LUTs 78 of Figs. 15-17. Significantly, Wright's "raw components" (i.e., the outputs from the FIR filters) are <u>not</u> used to retrieve values from any LUTs. As such, Wright does not teach or even suggest the features of claims 77 and 86.

In view of the foregoing, the Appellant submits that claim 77 is allowable over Wright. For similar reasons, the Appellant submits that claim 86 is allowable over Wright. Assuming entry of the after-final amendment, claims 74 and 83 effectively depend from claims 77 and 86, respectively. As such, the Appellant submits that the combination of claims 74 and 77 and the combination of claim 83 and 86 are also allowable over Wright.

<u>Group D:</u>

As to Group D, according to claims 75 and 84, different copies of the raw signal are applied to a plurality of band-pass filters to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies, and the plurality of modified components are summed to generate the modified signal.

In the final office action, the Examiner cited Figs. 1 and 8 (block 52A) and column 15, line 54, to column 16, line 26, of Wright as teachings the features recited in claim 75 and 84. The Appellant submits that the Examiner mischaracterized the teachings in Wright in rejecting claims 75 and 84.

Fig. 8 shows a digital compensation signal processor (DCSP) that converts an input signal Vm(t) into an output signal Vd(t). In particular, the output signal Vd(t) is based on the sum of the outputs from four finite impulse response (FIR) filters 52A, where the input signal Vm(t) is applied to a first of the four FIR filters, the square of the input signal (i.e., $Vm^2(t)$) is applied to a second of the four FIR filters, $Vm^3(t)$ is applied to a third of the four FIR filters, and $Vm^4(t)$ is applied to a fourth of the fourth FIR filters. The filter coefficients for the four FIR filters 52A are retrieved from multi-dimensional table 52H

using three different index values, where a first index value is generated by applying the input signal Vm(t) to block 52C and quantizer 52D, a second index value is generated by applying the input signal Vm(t) to differentiator 52J and quantizer 52K, and a third index value is generated by applying the input signal Vm(t) to integrator 52L and quantizer 52M.

The Appellant does not understand how these teachings in Wright constitute an example of the features recited in claims 75 and 84. For example, according to claims 75 and 84, different copies of the raw signal are applied to a plurality of band-pass filters to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies. In Wright, input signal Vm(t) would be the raw signal of claims 75 and 84.

It is not clear, however, what elements in Wright are examples of the plurality of band-pass filters of claims 75 and 84. In claims 75 and 84, the plurality of band-pass filters generate a plurality of raw components, where, for each raw component, a value is retrieved from a LUT based on the amplitude of the raw component. In Wright, the only LUT is table 52H, but the only "components" used to retrieve values from table 52H are the outputs from quantizers 52D, 52K, and 52M. In order for Wright to teach the features of claims 75 and 84, the three combinations of blocks 52C and 52D, blocks 52J and 52K, and blocks 52L and 52M would have to be examples of the plurality of band-pass filters of claims 75 and 84. But those combinations of blocks are not band-pass filters. Nor does each of those combinations of blocks correspond to a different frequency or band of frequencies, as explicitly recited in claims 75 and 84.

Moreover, even if those three different combinations of blocks were examples of a plurality of band-pass filters corresponding to different frequencies or bands of frequencies (which the Appellant does not admit), claims 75 and 84 also recite that the plurality of modified components are summed to generate the modified signal. According to claims 77 and 86, the "modified components" are the values retrieved from the LUTs. In Wright, the values from the LUTs are the filter coefficients for FIR filters 52A. These filter coefficients are <u>not</u> summed to generate the modified signal. They are used in FIR filters 52A to filter each different power of the input signal Vm(t). The only values summed in Wright are the outputs of those FIR filters. Those outputs may be dependent on, but they are <u>not</u> equal to the filter coefficients retrieved from table 52H. Thus, here, too, Wright does not teach an example of what is explicitly recited in claims 75 and 84.

In view of the foregoing, the Appellant submits that the Examiner mischaracterized the teachings in Wright in rejecting claims 75 and 84. Assuming entry of the after-final amendment, the Appellant submits that this provides additional reasons for the allowability of the combination of claims 75 and 77 and the combination of claims 84 and 86 over Wright.

Group E:

As to Group E, according to claims 76 and 85, the raw signal is transformed from a time domain to a frequency domain to generate the plurality of raw components, and the plurality of modified components are transformed from the frequency domain to the time domain to generate the modified signal.

In the final office action, the Examiner cited Fig. 25A and column 36, lines 19-42, of Wright as teaching "transforming the raw signal from a time domain to a frequency domain to generate the plurality of raw components." The Examiner also cited Fig. 20 and column 31, lines 27-54, as teaching "transforming the plurality of modified components from the frequency domain to the time domain to generate the modified signal." The teachings cited in Wright are related to the generation of the data (i.e., the filter coefficients) to be stored in Wright's LUTs. The recitations in claim 76 and 85, on the other hand, are related to the generation of the index values used to retrieve data from LUTs. These are two very different things.

According to claims 76 and 85, the raw signal is transformed from a time domain to a frequency domain to generate the plurality of raw components, where, according to claims 77 and 86, the amplitudes of the raw components are the index values used to retrieve modified components from the LUTs. Thus, in claims 76 and 85, the raw components are the index values for the LUTs and the modified components are the data stored in the LUTs. The teachings in Wright are related to the generation of the data stored in LUTs, not the generation of index values for LUTs.

Furthermore, according to claims 76 and 85, the plurality of modified components (i.e., the data retrieved from the LUTs) are transformed from the frequency domain to the time domain to generate the modified signal. While it is true that Wright teaches, in Fig. 20, a transformation from a frequency domain to a time domain, the data generated in Wright is not a modified signal corresponding to a combination of data retrieved from different LUTs (as recited in claims 73 and 82). Rather, in Wright, the outputs from the transformation are the FIR coefficients 78 (i.e., the data to be stored in Wright's LUT).

Thus, the Appellant submits that the Examiner has confused teachings in Wright that are related to the generation of data to stored in a LUT with the features of claims 76 and 85, which are related to the generation of index values used to retrieve data from LUTs.

Assuming entry of the after-final amendment, the Appellant submits that this provides additional reasons for the allowability of the combination of claims 76 and 77 and the combination of claims 85 and 86 over Wright.

Group F:

As to Group F, according to claims 80 and 89, the corresponding raw component and the corresponding feedback component are applied to a divider to generate the corresponding update value.

In the final office action, the Examiner cited Figs. 1 and 2 (block 52) and column 7, line 34, to column 11, line 20, of Wright as teachings the features recited in claims 80 and 89. The Appellant submits that the Examiner mischaracterized the teachings in Wright in rejecting claims 80 and 89.

In the present application, divider 118 of Fig. 6 and divider 126 of Fig. 7 are each an example of the divider of each of claims 80 and 89. (Note that dividers 118 and 126 perform the mathematical "division" operation, which is different from and should not be confused with the signal "division" functions recited in claims 73, 79, 82, and 88.) In particular, divider 118 applies the mathematical "division" operation to the output from time delay element 120 (i.e., an example of the "corresponding raw component" of claims 80 and 89) and to the output from band-pass filter 108 (i.e., an example of the "corresponding feedback component" of claims 80 and 89).

The features recited in claims 80 and 89 are related to the adaptive updating of the values stored in the LUTs, as recited in claims 78-79 and 87-88 from which claims 80 and 89 depend. The teachings cited by the Examiner do not relate to the adaptive updating of values stored in Wright's LUT. Rather, those particular teachings relate to the pre-distortion of an input signal using Wright's LUT.

Significantly, none of those teachings has anything to do with applying the mathematical "division" operation to a raw component and a corresponding feedback component.

Assuming entry of the after-final amendment, the Appellant submits that this provides additional reasons for the allowability of the combination of claims 77 and 80 and the combination of claims 86 and 89 over Wright.

Group G:

As to Group G, according to claims 81 and 90, outputs from the divider are integrated, over time, to generate the corresponding update value.

In the final office action, the Examiner cited Figs 15-19 (block 88) and column 29, line 40, to column 31, line 54, of Wright in rejecting claims 81 and 90. The Appellant submits that the Examiner mischaracterized the teachings in Wright in rejecting claims 81 and 90.

As in the case of claims 80 and 89, in this case, the Examiner has once again confused teachings in Wright that relate to the pre-distortion of an input signal using Wright's LUT with claims that relate to the adaptive updating of values stored in LUTs.

While Wright teaches a mathematical "integration" operation in block 88 of Figs. 17-18, that integration operation is not applied to outputs from a divider that receives a raw component and a corresponding feedback component. Wright's integrator 88 receives only the input signal Vm(t).

Nor does Wright's integrator 88 generate an update value for data stored in a LUT. At most, Wright's integrator 88 is used to generate an index value for retrieving data from a LUT. The Examiner has once again confused data stored in a LUT with the index values used to retrieve data stored in a LUT.

Assuming entry of the after-final amendment, the Appellant submits that this provides additional reasons for the allowability of the combination of claims 77 and 81 and the combination of claims 86 and 90 over Wright.

IX. APPENDIX OF CLAIMS (37 CFR 1.192(c)(9))

The claims involved in the appeal are the claims that were pending prior to the filing of the un-entered after-final amendment, which claims are as follows:

51. A lineariser for reducing distortion of an output signal of signal handling equipment, by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal.

54. A lineariser according to claim 51, wherein the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

57. A lineariser according to claim 51, further comprising a divider for dividing the raw signal into a number of components having different frequencies or bands of frequencies.

62. A method of reducing distortion of an output signal of signal handling equipment, said method comprising the steps of selecting data from a store in response to the amplitude and frequency content of a raw signal, and using the data in distortion reduction processing of the raw signal.

65. A method according to claim 62, wherein the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

68. A method according to claim 62, further comprising the step of dividing the raw signal into a number of components having different frequencies or bands of frequencies.

73. A method for reducing distortion in an output signal generated by signal handling equipment, the method comprising:

(a) dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies;

(b) generating a modified component for each raw component based on the amplitude of the raw component; and

(c) combining the plurality of modified components to generate a modified signal.

74. The invention of claim 73, wherein:

the signal handling equipment is an amplifier adapted to amplify the modified signal; and

the modified signal is generated by applying pre-distortion to the raw signal, wherein the pre-distortion reduces the distortion in the output signal generated by the amplifier.

75. The invention of claim 73, wherein:

step (a) comprises applying different copies of the raw signal to a plurality of band-pass filters to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies; and

step (c) comprises summing the plurality of modified components to generate the modified signal.

76. The invention of claim 73, wherein:

step (a) comprises transforming the raw signal from a time domain to a frequency domain to generate the plurality of raw components; and

step (c) comprises transforming the plurality of modified components from the frequency domain to the time domain to generate the modified signal.

77. The invention of claim 73, wherein:

step (b) comprises retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component; and

each different frequency or band of frequencies has its own LUT.

78. The invention of claim 77, further comprising (d) adaptively updating values stored in each LUT.

79. The invention of claim 78, wherein step (d) comprises:

(1) generating a feedback signal based on the output signal of the signal handling equipment;

(2) dividing the feedback signal into a plurality of feedback components, each feedback component corresponding to a different frequency or band of frequencies;

(3) generating, for each frequency or band of frequencies, an update value for the corresponding LUT based on the corresponding raw component and the corresponding feedback component; and

(4) updating each LUT based on the corresponding update value.

80. The invention of claim 79, wherein step (d)(3) comprises applying the corresponding raw component and the corresponding feedback component to a divider to generate the corresponding update value.

81. The invention of claim 80, wherein step (d)(3) further comprises integrating, over time, outputs from the divider to generate the corresponding update value.

82. An apparatus for reducing distortion in an output signal generated by signal handling equipment, the apparatus comprising:

(a) means for dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies;

(b) means for generating a modified component for each raw component based on the amplitude of the raw component; and

(c) means for combining the plurality of modified components to generate a modified signal.

83. The invention of claim 82, wherein:

the signal handling equipment is an amplifier adapted to amplify the modified signal; and

the modified signal is generated by applying pre-distortion to the raw signal, wherein the pre-distortion reduces the distortion in the output signal generated by the amplifier.

84. The invention of claim 82, wherein:

means (a) comprises a plurality of band-pass filters connected to receive different copies of the raw signal and adapted to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies; and

means (c) comprises a combiner adapted to sum the plurality of modified components to generate the modified signal.

85. The invention of claim 82, wherein:

means (a) comprises a transform adapted to transform the raw signal from a time domain to a frequency domain to generate the plurality of raw components; and

means (c) comprises an inverse transform adapted to transform the plurality of modified components from the frequency domain to the time domain to generate the modified signal.

86. The invention of claim 82, wherein:

means (b) comprises a plurality of LUTs;

each LUT corresponds to a different frequency or band of frequencies; and

each LUT is adapted to provide, for the corresponding raw component, a value for the corresponding modified component based on the amplitude of the raw component.

87. The invention of claim 86, further comprising (d) means for adaptively updating values stored in each LUT.

88. The invention of claim 87, wherein means (d) comprises:

(1) means for generating a feedback signal based on the output signal of the signal handling equipment;

(2) means for dividing the feedback signal into a plurality of feedback components, each feedback component corresponding to a different frequency or band of frequencies;

(3) a feedback and control mechanism adapted to generate, for each frequency or band of frequencies, an update value for the corresponding LUT based on the corresponding raw component and the corresponding feedback component; and

(4) means for updating each LUT based on the corresponding update value.

89. The invention of claim 88, wherein the feedback and control mechanism comprises a divider adapted to receive the corresponding raw component and the corresponding feedback component to generate the corresponding update value.

90. The invention of claim 89, wherein the feedback and control mechanism further comprises an integrator adapted to integrate, over time, outputs from the divider to generate the corresponding update value.

Respectfully submitted,

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Date: 12/5/05

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CLAIMS AFTER ENTRY OF AFTER-FINAL AMENDMENT

If the after-final amendment is entered, then the claims involved in the appeal would be as follows:

51. A lineariser for reducing distortion of an output signal of signal handling equipment, by processing a raw signal with data selected from a store in response to the amplitude and frequency content of the raw signal, wherein the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

57. A lineariser according to claim 51, further comprising a divider for dividing the raw signal into a number of components having different frequencies or bands of frequencies.

62. A method of reducing distortion of an output signal of signal handling equipment, said method comprising the steps of selecting data from a store in response to the amplitude and frequency content of a raw signal, and using the data in distortion reduction processing of the raw signal, wherein the store comprises a group of look-up tables, each table corresponding to a component of the raw signal having a different frequency or band of frequencies, and each table comprising a table of coefficients, each coefficient associated with a value of the amplitude of the component of the table.

68. A method according to claim 62, further comprising the step of dividing the raw signal into a number of components having different frequencies or bands of frequencies.

73. A method for reducing distortion in an output signal generated by signal handling equipment, the method comprising:

(a) dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies;

(b) generating a modified component for each raw component based on the amplitude of the raw component by retrieving, for each raw component, a value for the corresponding modified component from a look-up table (LUT) based on the amplitude of the raw component, wherein each different frequency or band of frequencies has its own LUT; and

(c) combining the plurality of modified components to generate a modified signal.

74. The invention of claim 73, wherein:

the signal handling equipment is an amplifier adapted to amplify the modified signal; and

the modified signal is generated by applying pre-distortion to the raw signal, wherein the pre-distortion reduces the distortion in the output signal generated by the amplifier.

75. The invention of claim 73, wherein:

step (a) comprises applying different copies of the raw signal to a plurality of band-pass filters to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies; and

step (c) comprises summing the plurality of modified components to generate the modified signal.

76. The invention of claim 73, wherein:

step (a) comprises transforming the raw signal from a time domain to a frequency domain to generate the plurality of raw components; and

step (c) comprises transforming the plurality of modified components from the frequency domain to the time domain to generate the modified signal.

78. The invention of claim 73, further comprising (d) adaptively updating values stored in each LUT.

79. The invention of claim 78, wherein step (d) comprises:

(1) generating a feedback signal based on the output signal of the signal handling equipment;

(2) dividing the feedback signal into a plurality of feedback components, each feedback component corresponding to a different frequency or band of frequencies;

(3) generating, for each frequency or band of frequencies, an update value for the corresponding LUT based on the corresponding raw component and the corresponding feedback component; and

(4) updating each LUT based on the corresponding update value.

80. The invention of claim 79, wherein step (d)(3) comprises applying the corresponding raw component and the corresponding feedback component to a divider to generate the corresponding update value.

81. The invention of claim 80, wherein step (d)(3) further comprises integrating, over time, outputs from the divider to generate the corresponding update value.

82. An apparatus for reducing distortion in an output signal generated by signal handling equipment, the apparatus comprising:

(a) means for dividing a raw signal into a plurality of raw components, each raw component having an amplitude and each raw component corresponding to a different frequency or band of frequencies;

(b) means for generating a modified component for each raw component based on the amplitude of the raw component, wherein:

means (b) comprises a plurality of LUTs;

each LUT corresponds to a different frequency or band of frequencies; and

each LUT is adapted to provide, for the corresponding raw component, a value for the corresponding modified component based on the amplitude of the raw component; and

(c) means for combining the plurality of modified components to generate a modified signal.

83. The invention of claim 82, wherein:

the signal handling equipment is an amplifier adapted to amplify the modified signal; and

the modified signal is generated by applying pre-distortion to the raw signal, wherein the pre-distortion reduces the distortion in the output signal generated by the amplifier.

84. The invention of claim 82, wherein:

means (a) comprises a plurality of band-pass filters connected to receive different copies of the raw signal and adapted to generate the plurality of raw components, each band-pass filter corresponding to a different frequency or band of frequencies; and

means (c) comprises a combiner adapted to sum the plurality of modified components to generate the modified signal.

85. The invention of claim 82, wherein:

means (a) comprises a transform adapted to transform the raw signal from a time domain to a frequency domain to generate the plurality of raw components; and

means (c) comprises an inverse transform adapted to transform the plurality of modified components from the frequency domain to the time domain to generate the modified signal.

87. The invention of claim 82, further comprising (d) means for adaptively updating values stored in each LUT.

88. The invention of claim 87, wherein means (d) comprises:

(1) means for generating a feedback signal based on the output signal of the signal handling equipment;

(2) means for dividing the feedback signal into a plurality of feedback components, each feedback component corresponding to a different frequency or band of frequencies;

(3) a feedback and control mechanism adapted to generate, for each frequency or band of frequencies, an update value for the corresponding LUT based on the corresponding raw component and the corresponding feedback component; and

(4) means for updating each LUT based on the corresponding update value.

89. The invention of claim 88, wherein the feedback and control mechanism comprises a divider adapted to receive the corresponding raw component and the corresponding feedback component to generate the corresponding update value.

90. The invention of claim 89, wherein the feedback and control mechanism further comprises an integrator adapted to integrate, over time, outputs from the divider to generate the corresponding update value.